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Work—II.

We were, through lack of space, unable to deal with the whole of the recommendations set out in the Report published by the Conservative Committee on Industry, many of which, if adopted, would have profound repercussions in foundry circles. For instance, on the employment of women in industry, the Report says "no industrial difference of treatment between men and women could, or should, be sustained on the ground of difference in sex. If they are doing equal work, their remuneration should be equal." A proviso is added that family allowances and income-tax allowances may have to be appropriately adjusted. An important part of the Report is devoted to the export trade, which it is deemed essential to develop if this country is to maintain its standard of living, let alone improve it. One sensible point for the immediate post-war period is the release of raw materials conditional upon a percentage being used up for the manufacture of exports. Imperial preference in its widest aspect is advocated, and it is our personal view that this is a wise step, as it operates in a market where there are ties distinctly stronger than those based on a customer and supplier structure. The Report hopes for the strengthening and expansion of such institutions as the International Labour Office, to implement, no doubt, such notions as we postulated only two weeks ago, when we suggested that goods entering the export market should carry a *cachet* indicating that manufacturing conditions had complied with internationally unified factory acts. This sort of "good housekeeping certificate" warrants wider publicity than we can command and the attention of an abler propagandist. The Report suggests that international cartels may not be too irksome, providing that the participants —at least the British—present all draft agreements to the Board of Trade for endorsement for signing, in order that they may conform with the public interest. The Board of Trade, the name of which, it is suggested, should be altered to the Ministry of Industry and Commerce, should in the future be staffed, as would other Government departments, by a more business-conscious staff. This would result from the suggestion that civil servants should for a period be attached to industrial concerns in order to learn the difficulties to be associated with the export of goods. There are reiterated desires for a closer collaboration between State and industry, and an obvious channel is the trade association. The Report sums up trade association activities and obligations as follows:—"The coming together of different firms in an industry to form a trade association is an important and generally valuable development in modern industry. We refer, of course, to trade associations properly conducted for constructive purposes, not to mere price rings. They can perform the same functions as trade unions in facilitating collective bargaining. They can act as an instrument for stimulating research and pooling its results. They can furnish a reliable statistical service for the industry, and can conduct market surveys at home or overseas more systematically than is usually within the power of a single firm. But the outstanding service is that they can provide a recognised channel for consultation between the Government and the industry on questions where public policy is involved. We do not consider that firms should be compelled to join a trade association against their will. Our view is that genuinely representative bodies that speak for each industry are desirable, but if they spring from spontaneous and voluntary co-operation, they will be a healthier growth." A revolutionary suggestion in the Report is made to meet the situation when pressing shortages of essential materials may have been overtaken, and as a result manufacturers may get "cold feet." In this case the

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THE HEATING OF OPEN-HEARTH FURNACES WITH MIXED COKE-OVEN AND BLAST-FURNACE GAS

Mr. R. W. Evans, B.Met. (of Guest Keen Baldwins Iron & Steel Company, Limited, Port Talbot, South Wales), in a Paper which the Iron and Steel Institute has published bearing the above title, has drawn the following conclusions.

The conversion of a producer-gas-fired furnace plant to mixed-gas firing or to firing with cold coke-oven gas plus tar is generally carried out at the same time as increased quantities of coke-oven gas and clean blast-furnace gas are made available. If the coke-oven gas is rich in methane and heavy hydrocarbons, the regeneration of a blast-furnace/coke-oven-gas mixture is as efficient and economic, so far as steel-making is concerned, as any other method of firing. Where, however, the coke-oven gas is lean, containing less than 27 per cent. of methane with a normal heavy hydrocarbon content, tar must be used as an artificial illuminant. The difficulties of efficiently introducing tar with mixed gases are considerably greater than when cold coke-oven gas plus tar are used, the difficulties being chiefly concerned in the shape of the gas port, which even in the case of producer-gas operation, is the major factor in determining the life of the furnace. The introduction of a mixture of cold coke-oven gas with tar as an illuminant is effected through a water-cooled burner; the direction of the flame is constant, and there is no worry about the gas-checker temperatures, there being no gas regenerators.

In any plant where the amount of coke-oven and blast-furnace gas available becomes increased and, on the grounds of economy, the scrapping of the producer plant is considered together with the conversion of the open-hearth plant to firing with available gases, the question of the most efficient utilisation of the total gas surplus is one to which the most searching deliberation should be given.

Provided that the blast-furnace gas can be efficiently and economically used in other spheres of heat requirement, the author is of the opinion that the best method of firing open-hearth furnaces is to use cold coke-oven gas and tar, tar oil or pitch, particularly where the very high metallurgical loads which have to be carried require tilting furnaces rather than fixed furnaces and where the coke-oven gas is likely to be of a lean nature.

An open-hearth operator who has confidence in the regularity of his heat input and resulting flame temperature is relieved of at least half of his normal troubles; he can then devote his time to the ultimate duty of every open-hearth manager, that of producing more, better and cheaper steel.

WILL THE LAST recipient of "Malleable Iron Facts," which is being circularised against requests, be so kind as to notify us?

TEMPILSTIKS

The accurate preheating of high tensile steels, non-ferrous metals and cast iron has been established as being essential to the production of sound welded constructions. The difficulty in the past has been in obtaining a suitable method of reading preheat temperatures under workshop conditions; Tempilstiks have been found to be both accurate (± 1 deg. F.) and easy to use; they are now readily available for the following temperatures—125, 150, 175, 200, 225, 250, 275, 300, 350, 400, 450, 500, 550, 600, 650, and 700 deg. F.

Tempilstiks are chemical mixtures (rather like a crayon) with fixed melting points, and may be used in two ways.

(1) A mark about ½ in. long is made on the job to be welded in much the same way as a chalk mark would be made. Heat is then applied, and when the mark melts and virtually disappears, the temperature stated on the particular Tempilstik being used has been reached. This method should only be used when the preheating flame does not play directly on the locality where the mark has been made.

(2) Where the entire surface of the work may come into contact with the preheating flame, the temperature is ascertained by periodically removing the flame and marking the job as before. The correct temperature has been reached when the mark melts as soon as it is made. The preheating chart shows ranges of preheat temperatures recommended for different metals, and can be had on application to the Director for Sundry Materials, Ministry of Supply, 8-10, Old Jewry, London, E.C.2.

CATALOGUE RECEIVED

Core-blowing Machine. What is perhaps the smallest and most compact type of core-blowing machine, known as the Corette, is described and illustrated in a 4-page pamphlet issued by W. J. Molyneux (Foundry Equipment), Limited, of Marlborough Works, Marlborough Road, London, N.19. It is capable of mass producing cores up to the weight of 12 ozs.

WORK—II

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Report states that "greater public attention should be given to such possibilities as, for instance, financing the bulk purchase of universally desirable household goods." Amongst those "desirable goods" are listed "refrigerators and labour-saving equipment of all kinds." This would certainly allow for better production planning and stabilise prices. We will conclude as we started: no matter to what shade of political opinion we adhere, this Report must command the serious attention of those who live by "work."

HIGH-DUTY IRON CASTINGS*

By E. MORGAN, M.Sc.

(The Stanton Ironworks Company, Limited)

Discussion of the New Technique from various practical aspects with special reference to high-phosphorus and refined irons

Introduction

In spite of the severe restrictions on supplies of hematite and other low-phosphorus pig-irons, foundries engaged in the manufacture of high-duty castings are still managing to carry on reasonably satisfactorily. This has been made possible by the extended use of high-phosphorus pig-irons and by the greater utilisation of refined irons.

A chance reader, happening to see the above statement and unacquainted with foundry matters, would hardly pause to consider what it implied, save perhaps to reflect that here was yet another instance of British industry adapting itself to the changed conditions brought about by the war. On the other hand, the foundryman is aware that many problems have had to be solved to make this possible. The author thought that the discussion of some of the problems involved, as they affect the user and maker of pig and refined irons, would be useful at this stage and might, at the same time, lead to a more economical use of materials which have to be imported into this country.

Phosphorus Content and Quality of Castings

In pre-war days, phosphorus was not regarded as a major problem in the manufacture of high-duty castings, the reason for this being that the plentiful supply of low-phosphorus iron available made it unnecessary to use the phosphoric type. There were good reasons for not employing phosphoric irons, but there is little doubt that the very fact that there was no particular need to do so had much to do with the fact that in the development of the high-duty type of iron, attention was mainly concentrated on low-phosphorus material. The outbreak of war and the effect it had on imports of low-phosphorus ironstone into this country made it necessary to turn attention once more to the common foundry iron in order to explore its possibilities. Fortunately, considerable work had been carried out on the influence of phosphorus before the war, and the results obtained from these and other investigations carried out since the war started have given us a fairly clear picture of the situation. It was known to what extent low-phosphorus content was essential. It was also known where it was possible to use high-phosphorus contents without sacrificing either strength or soundness, and this knowledge has enabled us to use the materials available to foundries at the present time to good advantage.

As regards mechanical strength, high-phosphorus contents have been avoided in certain types of castings through fear of excessive weakness and brittleness, and yet it has been known for many years that castings containing more than 1 per cent. of this element have been made which possess tensile strengths of 20 tons per sq. in. and above. For instance, the company with which the author is associated has been manufacturing pipes by the spun process, possessing tensile strengths exceeding 20 tons per sq. in. These pipes contain phosphorus in the region of 1 per cent. Reference may be made to the recent investigations of the British Cast Iron Research Association which have shown that if the total carbon and silicon contents are controlled to the same degree as they are in the case of low-phosphorus high-duty castings, a high phosphorus content need not prove an obstacle to the attainment of high tensile strengths, and the following examples will illustrate this point. With a carbon content between 3.3 and 3.6 per cent., Grade A castings can be obtained with silicon content up to 2.2 per cent. and phosphorus up to 1.1 per cent. For the same carbon content, a reduction in silicon and phosphorus contents to 1.8 and 0.7 per cent. respectively gives castings fulfilling the requirements of B.S.I. Grade 1. By using lower total carbon irons, the silicon and phosphorus limits may be raised. Thus, with carbon content of the order of 3.1 and 3.3 per cent., Grade A castings can be produced with silicon up to 2.5 per cent. and phosphorus of 1.2 per cent., and a reduction of phosphorus to 0.9 per cent. gives Grade 1 iron. Again, if the silicon and phosphorus contents are reduced to 2.0 and 0.7 per cent. respectively, Grade 2 castings with tensiles in excess of 18 tons on the 0.875-in. cast bar can be obtained.

Another objection to the use of high phosphorus in castings, particularly those subjected to rigorous pressure tests, is due to the risk of internal porosity due to shrinkage. Such shrinkage defects are caused by the inability of the metal to feed properly in certain parts of the casting. Such tendencies have been more noticeable in high- than in low-phosphorus irons, and for certain types of intricate castings of thin section, very close control is exercised over the metal to ensure that the phosphorus does not exceed about 0.3 per cent. Where it is possible to feed castings properly, porosity can be overcome, and to-day there are many foundries turning out perfectly sound machine tool castings in irons having phosphorus contents of 1 per cent. and over. The use of denseners to promote more symmetrical solidification in the casting than its design would otherwise permit is also being carried out satisfactorily.

* Paper presented to the Wales and Monmouth Branch of the Institute of British Foundrymen at Cardiff.

High-Duty Iron Castings

The use of high-phosphorus iron can be extended satisfactorily to produce sound castings by careful control of the carbon and silicon contents. Timmins and West have shown how shrinkage is affected by the three elements carbon, silicon and phosphorus. Timmins shows how sound castings can be produced even in high-phosphorus irons by the exercise of proper control over the carbon and silicon contents. The following examples will serve to illustrate this point. In the case of irons containing 1.5 per cent. silicon, porosity due to shrinkage is likely to occur if the phosphorus content exceeds 0.4 per cent. when the carbon exceeds 3.5 per cent. With carbon below 3.4 per cent., for the same silicon content, the phosphorus can be raised to 1.2 per cent. When the section of the casting decreases, making it necessary to increase the silicon content, a reduction in both carbon and phosphorus content is necessary. Thus, with 2 per cent. silicon and carbon exceeding 3.3 per cent., porosity may appear at about 0.3 per cent. phosphorus. With carbon less than 3.2 per cent., the phosphorus may be raised to 1.2 per cent. An increase in silicon to 3 per cent. still further reduces the permissible amounts of carbon and phosphorus. For this silicon content and with carbon in excess of 2.9 per cent., the limiting phosphorus content is 0.2 per cent. A reduction in carbon to 2.7 per cent., however, makes it possible to use up to 1.2 per cent. phosphorus for the same silicon content.

Control of Composition

So far, the author has tried to indicate to what extent it is possible to employ high phosphorus contents for the manufacture of high-duty castings. It boils down to this, namely, that the successful utilisation of irons and mixtures containing phosphorus in reasonably large amounts depends on being able to control the composition of the mixture accurately, and with particular reference to the elements carbon, silicon and phosphorus.

To take an example: Assume that a foundry has to make castings fulfilling B.S.I. standards for Grade 1, using as much phosphorus as possible in the iron, let it start with an ordinary No. 3 foundry iron containing phosphorus of 1.2 to 1.4 per cent. and with silicon of 2.5 to 3 per cent. Theoretically, what is needed in this case is to reduce the carbon and phosphorus contents, the silicon content being fixed by the section of the casting. One could dilute the mixture with respect to these elements by melting the pig-iron with steel scrap. The problem is to carry out the melting of such a mixture in the cupola furnace. Phosphoric iron melts at a lower temperature than steel, and consequently it is a difficult matter to obtain homogeneity after melting. The composition of the iron has to be adjusted further after melting, by additions of ferro-alloys to the ladle. Such additions constitute an important feature of the manufacture of high-duty castings at the present day, but have to be carried out cautiously and in such a way as not to cause the temperature and fluidity of the iron to decrease.

An alternative and an easier method that is being used with satisfaction is to employ mixtures of phosphoric iron and low phosphorus refined iron. By using refined iron of the correct composition, it also becomes possible to attain the desired composition in the castings without the need for ferro-alloy additions.

Foundry Pig-iron

The bulk of the phosphoric pig-iron made at the present time is smelted in large output blast furnaces. Changing conditions have made this step an economical necessity, but the developments in this direction have been viewed with concern by many foundrymen. The reason for this is that foundry pig-iron has ceased to have that individuality that it possessed at one time, and fracture which has been so long the yardstick in the foundry appears to have lost its value. This tendency has given the impression that blast furnace pig-iron has deteriorated in quality as a foundry material, and indeed the student of the history of blast furnace developments might be forgiven for concluding that improvements have been forced on the industry as an economical necessity and that quality has been given second place. He finds, in the literature on the subject, that more and more attention has been given to the blast furnace from the efficiency point of view. Each innovation has been carefully considered and criticised from this point of view, and rarely does he find reference to the quality of the iron as a criterion of improvement.

In actual fact, however, blast furnace developments have been to the advantage of the foundryman as well. In comparing foundry iron as made, say 50 years ago, with that made to-day, due regard has to be given to the changed conditions. To mention only two of them, the iron ores available to-day are leaner and therefore poorer, and the demand for pig-iron is greater. It is certainly an achievement on the part of the pig-iron maker that he is still able to provide pig-iron for the foundries at a low price.

Considering what the present day foundry requires of the pig-iron, it can be said that the foundryman appreciates the fact that fracture is now inadequate because of the greater control which he has to exercise on the composition of his mixtures. He realises that there is too great a dissimilarity between the compositions of similarly fractured irons. He knows that for soft castings it is dangerous to use mottled or white-fractured pig-irons in the mixture, but subject to such reservations he is prepared to buy iron irrespective of fracture provided the composition is what he requires. This is not to say that he can expect the blast furnace to turn out iron to any particular specification; nor is this even desirable. His best policy is to agree on a suitable composition with the supplier who knows what the furnace is turning out. The reason for this is that he is more likely to obtain iron of uniform composition from a furnace which is being operated for long periods under

constant conditions, than he would from a furnace which is being frequently adjusted to produce irons to various chemical specifications.

Although the increased size of blast furnaces and the faster driving tend to make for heterogeneity in composition, these tendencies have been effectively countered by the pig-iron manufacturer in various ways, such as by calcining and careful grading of the ore before it enters the furnace, and by maintaining a constant hearth temperature, etc.

Machine-cast Foundry Iron

The introduction of machine-cast pig-iron is another development, having as one of its objects the supply of iron of uniform composition to the foundryman. Considered solely from the blast-furnace-plant point of view, the establishment of casting plants must be regarded as a logical development, and the use of such plants means a saving in space and labour costs, besides benefiting in other directions. One of the main advantages from the foundry point of view is that the whole of the tap from the furnace is collected in a large mixing receiver before the iron is taken to the casting plant. In this way, inequalities in composition of the iron in the well of the furnace are eliminated.

In essentials, the process of manufacture consists simply in taking the metal away from the blast furnace and pouring from the receiver into cast-iron moulds which are continually travelling up a shallow incline on a belt conveyor. The moulds are coated with lime wash and, after setting, the iron is water-sprayed. On reaching the top of the incline, the moulds empty into a cooling pit from which the slabs are subsequently lifted by a magnet crane into wagons for despatch or to go on to the stocking ground. A full account of the process of making machine-cast hematite was given to the Sheffield Branch by Jones.*

The successful manufacture of machine-cast phosphoric iron has involved the solution of many problems. With its low freezing point and relatively long freezing range, it was necessary to pay careful attention to the size and design of the moulds and to the speed of castings. Phosphoric iron, being less tough than hematite, requires more careful handling in manufacture. The design of the slab has to be such that no dangerous residual stresses are left in due to the accelerated rate of cooling compared with sand-cast iron. Overshadowing even these considerations is the need for a shape and size that is suitable for handling, breaking and stocking and for charging into cupolas, which may vary from about 24 in. to 6 ft. in diameter.

Most of these problems have now been solved, but there still remains the problem of persuading the more conservative type of foundryman that pig-iron does not lose any of its qualities by being cast into chill moulds instead of on the sand bed. Although the ideal sought is to retain as much of the carbon in the graphite form as in the ordinary pig, it sometimes happens, particularly in the lower silicon grades, that, due to the moulds not being filled properly, the fracture of the machine-cast iron appears to be hard. It may even be mottled. This tendency is also noticeable in the high-manganese class of iron. What has to be remembered is that the hard character of the iron is the result of the accelerated rate of cooling in the chill mould, and it differs in this respect from the hard fracture of sand-cast pig. In that case, the mottled fracture has been caused by high sulphur and/or low silicon. With the sand-cast pig, the hardness will persist on remelting, but in the case of the machine-cast pig, this effect disappears on remelting. Again, a consignment of machine-cast iron may show variations in the fractures which might suggest mistakes in sampling and loading. These differences also arise in the same way and are due to the relatively greater sensitivity of the iron with respect to fracture when cast into chills. Small differences in the temperature of the chills will also have this effect.

The advantages are readily seen, among them being cleanliness, freedom from sand, absence of sows, uniformity of size and uniformity of composition. At the present time of A.R.P. restrictions, there is one outstanding advantage. The use of the machine for casting the pigs has enabled the whole operation of smelting and casting to be carried out under cover and without interruption due to black-out regulations. This means not only that the furnace plant is in operation continuously on full capacity and therefore unrestricted as regards output, but that it is possible to maintain constant operating conditions which are so necessary to maintain the proper standard of quality.

Refined Irons

Refined irons, unlike blast-furnace pig-irons, can be made to any composition specified by the foundry. They can be supplied in small or large lots as required. At the present time a considerable quantity of refined iron is used in place of hematite and other low-phosphorus irons owing to the scarcity of such irons for foundry use. From this has arisen the erroneous views held by some people that refined irons are substitute materials. It is true that in some cases the very low-phosphorus refined irons are being used in place of hematite, but the actual situation is that refined iron has come to be recognised in many ways as an essential material for the production of high-duty irons, and even before the war, when there was no scarcity of low- and medium-phosphorus pig-irons, there was a steadily growing demand for refined irons, and this, it may be said, has not been entirely due to the fact that they can be made to any chemical specification, though that in itself is of great advantage.

Many other false ideas have been held about this material, and these may perhaps be a natural reaction arising from the use or mis-use of the term "refined." The term "refined" may conjure all manner of ideas concerning its mode of manufacture, and in many ways it is an unfortunate designation. Some

* FOUNDRY TRADE JOURNAL, Feb. 3, 1938.

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people think that the material is simply the result of melting different sorts of scrap together, the product being then analysed and stocked or sold according to the composition obtained. The writer has been told more than once how some foundries have been making their own refined iron for years. According to these people, all that they do is to collect odds and ends of scrap lying about the yard and melt down one or two charges at the end of the day and then pig the result either in sand or in chills. Obviously, there is something more in it than this, and the saying that "the proof of the pudding is in the eating" applies aptly to refined irons.

Refined irons are made from mixtures of hematite and foundry irons, selected scrap, both cast iron and mild steel, plus additions of ferro-alloys. They are manufactured in cupola furnaces, air furnaces, rotary furnaces and in converters, and special care is taken in the melting process to ensure that the product is suitable for the foundry. The writer is concerned with the manufacture of refined iron in the cupola furnace, and his remarks therefore apply to iron made in this manner.

One can obtain a reasonable idea of what the term "refined iron" means if consideration be given to the basic principles underlying the manufacture of high strength irons. The mechanical properties of the iron can be equated to the algebraic sum of the properties of the several structural constituents of the iron, and in order to obtain high strengths it is necessary to control the structure so that the mechanically strong elements of the structure predominate without at the same time causing the iron to lose any of its characteristics as a grey iron.

The total carbon content and the graphite content have to be low, the graphite flakes of uniform small size and distributed in a random fashion in a matrix which is pearlitic. These things are achieved by arranging for the chemical composition of the iron to suit exactly the section of the casting, and with the proper amount of control these results can be obtained by melting mixtures of pig-iron and scrap with a high proportion of steel scrap. Alloy additions are also necessary, and in some cases it is advisable to inoculate the iron before it enters the moulds.

With all the short-comings of the cupola, it is not too much to say that a good deal of the success that has been achieved in the manufacture of high-duty irons has been due to the fact that the melting is carried out for the most part in the cupola. It is also true to say that the use of a large percentage of steel scrap in cupola mixtures has advantages other than simply to reduce the carbon content and to dilute the mixture with respect to phosphorus. The author believes that the large proportions of steel melted in such mixtures plays an important part in determining the eventual structure obtained in the casting. The melting of pig and scrap iron mixtures is a simple matter which can be carried out in almost any type of cupola, but when steel is introduced in proportions exceeding 15 to 20 per cent., then a special technique has to be employed to cope with the problems that follow. Steel is more readily oxidised than pig-iron and scrap, and consequently more coke must be made available for combustion, not primarily because steel melts at a higher temperature than cast iron, but because it reaches the tuyere zone. An incandescent bed of coke at least 36 in. above the tuyeres is necessary for high steel mixtures, and the coke between charges must be heavy enough to maintain the bed at the proper height. For this reason, foundries which have been used to coke ratios of 12 to 1 or more, must use a much lower ratio, of the order of 8 to 1, or even lower. Some of the coke is required for carburisation purposes.

Again, due to the dissimilarity in melting rates of the charge constituents, there must be ample capacity in the well to allow proper mixing of the melt. In order to carry out the melting operation successfully, these are some of the main factors which have to be taken into consideration:—(1) There must be adequate supplies of steel scrap of uniform quality; (2) the coke must be of good quality; (3) it may be necessary to modify the design of the cupola, and (4) there has to be close metallurgical control over the melting.

There are some foundries in this country in the fortunate possession of all the necessary facilities to melt high steel mixtures satisfactorily, but there are many more which are not in this position. This is particularly the case with those foundries who have taken up the manufacture of high-duty castings since the outbreak of war, and which were previously light castings foundries, making domestic and builders' castings.

In such cases the alternative method of using refined iron with little or no steel in the mixtures has been successfully employed. The refined iron has already been made in much the same way that a foundry with the necessary facilities would use for melting the high steel mixture. The main differences are that the carbon, sulphur and phosphorus contents are lower in the refined iron, and silicon, manganese and other oxidisable elements higher, in order to cover the pick-up and losses respectively on remelting.

The Use of Refined Iron in the Foundries

A few remarks are desirable at this stage on the use of refined irons in foundry mixtures, especially when they are used for high-duty castings. A few foundries which turned over to the manufacture of high-duty castings experienced considerable trouble initially, arising mainly from the fact that they had not appreciated fully the vast differences between the type of iron required and the common iron, differences which call for different methods of handling the material. In one or two instances that have come to the notice of the author, it would appear that the impression was that the substitution of a refined iron of the required analysis for the pig and scrap mixture previously used was all that was necessary to produce a high-duty iron, and when disappointing results were obtained, the blame was put on to the refined iron.

The chief differences between the low-carbon, low-phosphorus high-duty iron and common engineering iron are that it has a higher freezing temperature and shorter range. For this reason, in order to ensure the necessary fluidity for casting purposes, the metal must leave the cupola at a considerably higher temperature than ordinary iron. Consequently, more coke has to be used to provide the additional heat in the metal. Adjustments are therefore necessary in the bed, and in the quantity of coke used between charges and also in the blast volume and pressure. Attention should therefore be given to the melting practice. It may also be necessary to make alterations in the shop. High-duty iron is relatively more sluggish than common iron and is also more subject to piping and sinking on bosses, etc. Moulds have to be filled quickly, liberal and larger ingates provided, and a more permeable sand used. It may also be necessary to have a more refractory type of moulding sand. Generally speaking, high-duty iron is less prone to porosity troubles due to shrinkage.

Ranges of Compositions Available

Normally, refined irons can be made to any analytical specifications put forward by the purchaser, bearing in mind, of course, the limitations imposed by the method of manufacture employed. Cupola-melted refined iron, for instance, will have a definite lower limit of carbon content. A reasonable figure is 2.7 per cent. In normal times, the higher carbon limit would be fixed by the carbon content and the proportion in the charges of pig-iron, which would be hematite in the case of low-phosphorus refined iron. At the present time, it is not practicable to produce refined irons with high carbon contents, because of the need to conserve hematite pig-iron for steelmaking.

Refined irons can be made to contain any desired silicon contents. Wartime restrictions, however, make it difficult to supply very high silicon refined irons, say with silicon in excess of 2.7 per cent. The reason for this is that the hematites available are usually low in silicon content, and heavy additions of ferro-silicon are necessary. The bulk of the ferro-silicon is imported, so that great care has to be exercised to make the available supplies go round. In the case of medium-phosphorus refined irons, with phosphorus contents of 0.5 to 0.7 per cent., this difficulty is not so pronounced, because in this case it is possible to make use of high-silicon phosphoric pig-irons for supplying a large proportion of the necessary silicon.

There are no limits on the manganese content of refined iron. With regard to sulphur content, a figure as low as 0.04 per cent. can be achieved by careful selection of raw materials and by desulphurising with soda ash, but in general this low sulphur content cannot be guaranteed and nothing below 0.05 to 0.06 per cent. should be asked for. Instances of unreasonable demands regarding sulphur contents have come to the notice of the writer. In most cases, the fault does not lie with the foundry purchasing the iron, but with the Government department or engineer who has imposed excessively low limits of sulphur in the castings without the least idea of the importance or otherwise of very low sulphur contents. Most people will agree that, in general, provided there is sufficient manganese present in the iron, the sulphur content of the casting can go up to 0.1 per cent.

In general, refined iron can be made in the cupola containing any phosphorus content from 0.08 per cent. maximum and upwards. The maker cannot readily guarantee anything below 0.08 per cent. This is not to say that 0.06 to 0.07 per cent. phosphorus irons are not being made, but the raw material supply position, being what it is, makes it impossible to obtain very low phosphorus contents regularly.

Special Alloy Refined Irons

All the useful alloying elements, such as nickel, chromium, molybdenum, etc., can be incorporated in refined irons, and such special irons are being made every day. There are very definite advantages to be obtained by incorporating the special alloy elements in the iron, but in view of present-day conditions, the purchaser should consider the matter very carefully before specifying special elements. In some cases it is preferable for the foundry to make its own additions when these are small. This practice tends to economise on some of the more expensive alloying elements, and this is particularly the case with the readily oxidised materials. If they are present in the refined iron, there will be a proportion lost during remelting.

An example will serve to illustrate the writer's point of view in these matters. A founder was using a special alloy refined iron for making high-duty castings. He was getting 20 tons per sq. in. minimum, but often the tensile was of the order of 22 tons. He received an inquiry for castings in a 22 tons per sq. in. iron, and wanted to use the same mixture for this new order. He asked whether we could supply him with a similar refined iron to the one he had been obtaining but containing in addition 0.5 per cent. molybdenum, because he thought that the presence of the molybdenum would give him the extra 2 tons per sq. in. which he required to be certain of meeting the specification. The advice given in this case was that the founder should try a small addition of molybdenum to his standard mixture and see what effect was produced. This was done and the results were good. In consequence, this particular customer is still buying the standard refined iron and using the same mixture as before and making molybdenum additions to the ladle when and as required.

Another aspect of the subject will now be discussed. A founder may specify refined iron containing a low phosphorus content of, say, 0.2 per cent. maximum and with a silicon content of 2.7 to 3.0 per cent. In addition he requires chromium of 0.4 to 0.5 per cent. From the maker's point of view, the problems in this case are quite serious. He has to make heavy additions of ferro-silicon and use a large proportion of hematite in his mixture. It frequently happens that either the silicon content or the chromium content is slightly outside the specification laid down. If

chromium were absent, the fact that the silicon is below or above specification does not greatly matter because the material is readily saleable. But, with chromium present, the material, generally speaking, has to be put in stock. This is a serious matter in view of the difficulties of obtaining hematite iron and ferro-alloys, and means that the industry is not making full use of the raw materials available. This is another instance of the point made above that the customer should consider very carefully before he lays down a specification calling for special alloying elements.

One of the virtues of refined iron is undoubtedly that it can be supplied to the required analysis, but from what the author has already attempted to point out, this should not be regarded as the most important virtue. Unfortunately many foundries still maintain this attitude, and insist on the iron conforming in all respects to the composition laid down.

The maker of refined iron is aware of the purposes for which the refined irons are employed, and he also knows of cases where different foundries making the same type of casting are ordering refined irons which differ in certain details one from the other. There are often good reasons for this, as conditions vary from one foundry to another, but as a rule, and particularly in these days, there should be considerably more relaxation regarding specifications. Provided the analysis of the iron supplied is not too much outside specification, and provided the true analysis of the iron is supplied with each consignment, the foundry in most cases should be able to employ the iron.

The whole purpose in discussing these matters is to try and emphasise the point that foundrymen should be prepared to discuss their problems fully with the refined iron maker and adopt a reasonable attitude towards specifications. Fortunately many foundries do this, and in consequence more economical use of available raw materials is being made than would otherwise be the case.

DISCUSSION

MR. J. H. V. WILLIAMS opened the discussion, thanking Mr. Morgan for a very interesting Paper. He referred to the Technical Committee's recommendation that higher phosphorus irons should be more generally used. He would like to ask whether the chill in machine cast pig-iron was communicated to the resulting casting.

MR. MORGAN in reply said that the fact that pig-iron was cast into chill moulds did not necessarily mean that the fracture would exhibit chill. There might be a certain amount of chill if the pigs were under size, but chill produced in this way was not carried forward into the casting. He had attempted to point this out in the lecture when he had compared hard fractures of sand cast pig with hard fractures in machine cast pigs. In the case of the sand cast pig, the fracture was hard by virtue of low silicon and high sulphur content, whereas it was possible with machine cast iron to have a hard fracture (chill) due to rapid rate of solidification. In some cases the castings made from machine cast iron as distinct from sand cast pig-iron might be a little closer. This would be caused by a slightly lower total carbon content due to the greater opportunity given to the kish to separate from the iron while it was being carried about in the receiver.

MR. WILLIAMS also referred to the use of soft blast in the cupola. Would this induce slow melting and a reduction in the temperature of the metal at the spout?

MR. MORGAN said that what he had in mind when he discussed the melting of high-duty cast iron mixtures in the cupola was that the blast should neither be excessive nor on the other hand should it be deficient. The whole point was that in melting such mixtures it was essential to have a sufficient depth of incandescent coke bed to ensure that not only was the metal well molten before reaching the tuyere zone, but would also be coming out of the cupola at a high temperature. For this reason the amount of coke in the bed and the ratio of metal to coke charges had to be carefully regulated. The blast should not be such that it had the effect of burning the bed away too rapidly. On the other hand, if too soft, the melting would be delayed and the temperature of the metal would tend to be low. They should start off with a relatively soft blast and increase it gradually until the full melting capacity of the cupola was achieved.

MR. KINSMAN asked what size of steel scrap would be suitable for a cupola 27 in. dia. across the melting zone, and why was the machine cast iron so large.

MR. MORGAN said that for a cupola of this small diameter it would be advisable to use steel scrap not more than about 10 in. in length and about ½ in. thick. With regard to the size of the machine cast pigs, the present size appeared to be suitable for all except the very small cupolas. There were several obstacles in the way of producing a smaller slab. The aim was to produce as much free graphite as possible and if the iron was cast in smaller sizes there would be a marked tendency to produce mottled fractures. While this in itself would not affect the quality of the iron for remelting purposes, the cooling stresses might cause the slabs to break up more readily due to the relatively brittle nature of high-phosphorus iron.

DR. BRYN JONES thought that the rapid cooling of machine-cast pigs would cause the inclusion of gases in the iron. These gases have a better opportunity for escaping from sand-cast pigs.

MR. MORGAN agreed in principle that when molten metal was rapidly solidified, dissolved gases could be retained in solution, but the difference in the rate of solidification of sand- and machine-cast pig was not sufficiently large to affect the dissolved gases appreciably. He did not consider that dissolved gases in ordinary pig-iron exerted any material effect. In any case, the amount retained in solution by rapid cooling would be released on reheating and remelting.

Noxious Elements

MR. KINSMAN referred to those elements in steel scrap and cast-iron scrap that were undesirable.

MR. MORGAN agreed that certain elements which are found in steel and cast-iron scrap are undesirable when manufacturing certain types of refined iron. Some people had stated that the presence of small amounts of nickel or chromium in refined iron used for making malleable castings had a bad effect. He felt that such statements required proof, but nevertheless the refined iron manufacturer had to be constantly on guard to keep such elements away from the refined iron. Similarly, traces of nickel and titanium were undesirable in castings required for certain types of piston rings, and it was quite a serious problem to avoid getting some of those elements in. Not only did these elements come from the steel scrap and cast-iron scrap, but it was almost impossible nowadays to obtain pig-iron which was entirely free.

MR. ROWLANDS asked whether nickel in white-heart malleable was beneficial or otherwise.

MR. MORGAN said that, although his own personal feeling was that in general small amounts up to 0.3 per cent. had no deleterious effect, he preferred not to be too dogmatic about it. As a matter of fact, a committee was at present sitting on this very problem and no doubt we should be hearing something definite before long.

MR. KINSMAN inquired why refined iron was sand cast and foundry pig-iron machine cast.

MR. MORGAN pointed out that theoretically there was no reason why refined iron should not be chill cast. He understood that some was actually cast in chills. In their own manufacture all the refined iron was put down on the beds, and by strict attention to the preparation of these beds and by keeping slag away, they were able to produce a clean pig. The iron was cast in combs each weighing a little over a ton, and these combs were dressed before breaking and loading into wagons. They had considered making some of their refined iron in chills, but there were certain practical difficulties to be overcome at the present time, and the idea had been temporarily shelved.

DR. BRYN JONES was of the opinion that impurities were retained in machine-cast pig-iron which would rise to the surface in sand-cast pig, due to the slower cooling.

MR. MORGAN did not agree with this opinion. In fact, in his opinion, machine-cast pig-iron was more likely to be free from impurities than sand-cast pig-iron. The reason for this was that the metal was held in the receiver for an appreciable time before casting, and during this period there was a certain amount of kish separating out. He had found from his own investigations with molten cast iron that, as the kish carbon floated to the top, it actually brought impurities with it to the surface. Furthermore, it was possible with this method of casting to treat the molten metal in the receiver with soda ash. This treatment also had a beneficial effect in the removal of impurities.

(*Continued at foot of next column.*)

A MECHANICKS' CLUB, 1710

On March 10, 1710, the Editor of *The Spectator* wrote of some rules he had seen chalked up in an ale house. "These laws," he writes, "were enacted by a knot of Artizans and Mechanicks." The notice read as follows:—

Rules to be observed in the Two-Penny Club, erected in this Place, for the Preservation of Friendship and good Neighbourhood.

I. *Every* Member at his first coming in shall lay down his Two-Pence.

II. *Every* Member shall fill his Pipe out of his own Box.

III. *If* any Member absents himself he shall forfeit a Penny for the Use of the Club, unless in case of Sickness or Imprisonment.

IV. *If* any Member swears or curses, his Neighbour may give him a Kick upon the Shins.

V. *If* any Member tells Stories in the Club that are not true, he shall forefeit for every third Lie an Half-penny.

VI. *If* any Member strikes another wrongfully, he shall pay his Club for him.

VII. *If* any Member brings his Wife into the Club, he shall pay for whatever she drinks or smoaks.

VIII. *If* any Member's Wife comes to fetch him home from the Club, she shall speak to him without the Door.

IX. *If* any Member calls another Cuckold, he shall be turned out of the Club.

X. *None* shall be admitted into the Club that is of the same Trade with any Member of it.

XI. *None* of the Club shall have his Cloathes or Shoes made or mended, but by a Brother Member.

XII. *No* non-juror shall be capable of being a Member.

The erudite Editor then suggests that his reader will be as well pleased with them as he would have been with the *Leges Convivales* of Ben Johnson, the Regulations of an old *Roman* Club cited by Lipson or the Rules of a *symposium* of an ancient Greek author.

(*Concluded from previous column.*)

MR. J. H. V. WILLIAMS stated that the real test of a refined iron was that the castings made from it were superior in all respects.

Vote of Thanks

DR. BRYN JONES, in proposing a vote of thanks to Mr. Morgan, was sure he expressed the feelings of all members present. They had listened to a very able discourse on the production of pig-iron and refined iron for the foundry, and the discussion that raised many questions by the members, to which Mr. Morgan had replied satisfactorily.

MR. W. WILLIAMS briefly seconded the vote of thanks. He was chiefly interested in the non-ferrous branch of the industry, and therefore he had different worries. He felt sure, however, that everyone present had benefited by being present that afternoon. After MR. MORGAN had suitably replied, the meeting was closed.

INSTITUTE ELECTS NEW MEMBERS

At a meeting of the Council, held at the Midland Hotel, Manchester, on January 15, the following—a record number—were elected to the various grades of membership.

As Subscribing Firm Members

African Iron & Steel Products, Limited, Germiston, South Africa (representative, E. Hepple); Albion Foundry (Pty.), Limited, 241, Marshall Street, Johannesburg (representative, J. Delaney); J. Barwell (S.A.), Limited, Alberton, Johannesburg (representative, K. Brecknell); B.M.S., Limited, Box 50, Cleveland, Johannesburg (representative, J. D. Fletcher); Eagle Brass & Iron Foundry (Pty.), Limited, 66, Westmoreland Road, Kensington, Johannesburg (representative, B. Stuthridge); Foundry Supply H. Steinhardt, 21/3, Harley Street, Yeoville, Johannesburg (representative, H. Steinhardt); R. Hunter & Company, Limited, Main Reef Road, Tooronga, Johannesburg (representative, C. Kerr); Rand Founders (Pty.), Limited, P.O. Box 200, Johannesburg (representative, A. J. Taylor); Reliance Foundry (Pty.), Limited, Box 2241, End Street, Johannesburg (representative, L. Goldstein); Rely Metal Works (Pty.), Limited, 35, Sprinz Avenue, Village Main, Johannesburg (representative, L. Weinberg); Selby Engineers (Pty.), Limited, P.O. Box 5903, Johannesburg (representative, E. R. Tickton); Shanks & Company, Limited, Tubal Works, Barrhead (representative, A. J. D. Black); Technaloy, Limited, 1-3, Whippendel Road, Watford (representative, W. H. Murad; Tonge & Taggart, Limited, 10, Windmill Lane, Sir John's Quay, Dublin (representative, J. H. Witham).

As Members

K. C. Cooper, foundry chemist, Newman Industries, Limited, Bristol; A. Darby, patternshop superintendent, Tangyes, Limited, Birmingham; R. C. Dent, director, Denham Brass & Iron Foundry, Transvaal; C. B. Doig, engineer, Mirrlees Watson, Glasgow; H. J. Gaunt, director, W. & J. Lawley, Limited, Wolverhampton; J. W. Gaunt, Junr., director, W. & J. Lawley, Limited, Wolverhampton; M. Goldstein, production engineer, Reliance foundry, Johannesburg; H. C. Hanson, general manager, Emscote Foundry Company, Leamington Spa; R. T. Hurst, B.Sc., works manager, Rd. Threlfall, Bolton; W. Keen, assistant melting shop manager, Wm. Jessop & Sons, Sheffield; E. A. Lambert, managing director, A. Robinson & Company, Limited, Liverpool; T. U. Matthew, B.Sc., Ph.D., technical director, S. & M. Engineering Works, Johannesburg; E. W. Oakes, technical salesman, General Refractories, Sheffield; J. Oswald, ironfounder, W. Macfarlane & Company, Glasgow; C. F. Smith, foundry manager, Reliance Foundry, Limited, Johannesburg); G. S. Graham, managing director, Denham Brass & Iron Foundry, Transvaal; R. F. Tarrant, managing director, Dorset Iron Foundry, Parkstone; Capt. E. R. Tickton, M.C., director, Selby Engineers (Pty.), Johannesburg; J. T. Wells, assistant foundry manager, Edgar Allen & Company, Sheffield; T. B. Crow, Ph.D., M.Sc., metallurgist, John Williams & Sons, Birmingham; A. M. Inglis, engineer, Patterson Hughes, Engineering, Scotland; A. Macnab, production manager, Rolls-Royce, Limited; J. Masson, foreman moulder, Cymric Foundry, Pontypridd; J. Elliot, deputy regional controller, Ministry of Supply, Newcastle; G. Osgood, M.A., F.I.C., director, J. Urmson, Limited, Stalybridge; L. Brain, director and works manager, Hale & Hale (Tipton); A. F. Davis, works manager, Simplex Electric Company, Birmingham; B. J. Dawkins, technical representative, Midland Monolothic; R. C. Leppington, director and general manager, Hale & Hale (Tipton); J. L. Ridgwell, technical representative, Fordath Engineering Company.

As Members (Transferred)

E. H. Brown, foundry technician, Ministry of Supply; T. Tyrie, superintendent, Scottish Laboratories, B.C.I.R.A.; J. H. D. Hobson, foundry manager, Tees-Side Bridge and Engineering Works, Stockton.

As Associate Members

H. Abnett, moulder, Phœnix Foundry, Limited, Florida, Transvaal; H. Anderson, patternshop chargehand, Grange Steel Foundry, Falkirk; J. Anderson, brass moulder, Barr & Stroud, Limited, Bonnybridge; R. Bagge, foreman patternmaker, J. Blake, Limited, Accrington; M. Banerjee, foundry instructor, Bengal Eng. Coll., India; F. Beet, B.Met., metallurgist, Ford Motor (Aero Engine); K. W. Belcher, foundry manager, Royal Mint Refinery, London, E.1; D. Brown, metallurgist, North British Steel Foundry, Scotland; D. A. Charles, head, progress dept., Harland & Wolff, Limited, Glasgow; W. Christie, assistant foreman moulder, Harland & Wolff, Limited, Glasgow; J. Clark, assistant foundry manager, Harland & Wolff, Limited, Glasgow; J. D. Currie, works chemist, Enamelled Metal Products Corporation, Limited, Leven; H. J. Curry, foundry foreman, M.C.P. Works, Slough; R. P. T. Daniel, patternmaker, Austin Motor Company, Birmingham; F. Davies, journeyman moulder, Howard & Bullough, Accrington; J. Fallows, brass foundry foreman, Gresham & Craven, Limited, Manchester; P. Graham, iron moulder, Craven Bros., Limited, Manchester; R. M. Grieve, works inspector, Grange Steel Foundry, Scotland; C. A. Hamer, journeyman moulder, Howard & Bullough, Accrington; F. R. Harmen, works manager, Watford Foundry Company; J. A. Hume, foreman patternmaker, Denham Brass Foundry, Transvaal; R. Ison, production manager, H. Wallwork & Company, Manchester; C. V. Juby, moulder, Umgeni Iron Works, Durban, S.A.; C. R. Knight, branch manager, Midland Monolithic; J. Lochhead, assistant foreman coremaker, Harland & Wolff, Limited, Glasgow; R. W. Lyall, patternmaker, H.M. Dockyard, Southampton; G. K. Melvill, machine shop foreman, East Rand Engineering Company, Germiston, S.A.; L. Moyle, foreman moulder, Denham Brass Foundry, Transvaal; R. McArthur, steel moulder, Clyde Alloy Steel, Motherwell; W. McBride, assistant works manager, Watford Foundry Company; D. McGowan, moulder, J. Allan, Senr., & Son; Wishaw; T. McRae, foreman ironmoulder, Harland & Wolff, Glasgow; S. Patchett, iron moulder, Glove &

(*Continued on page* 77.)

NOTES ON OIL-SAND PRACTICE IN THE ORDINARY FOUNDRY

For certain repetition jobs stack-moulding can show savings

By WM. Y. BUCHANAN

(*Continued from page* 54.)

Stack Moulding

This has been referred to in a previous article, and resulted in a considerable amount of private correspondence which indicated that the subject is very much a matter of practical interest to many foundrymen. For this reason it is again briefly referred to here. Stack moulding is usually carried out in green sand, using one drag box, a number of mid-parts, and finally one top part. The moulds may require expensive pattern plates, single or double sided, and the use of a hand jolt and strip or power jolt, squeeze and pattern draw machines.

The single-sided plate is fairly simple, as the mid-part has a flat top, but the process is complicated considerably when an impression of the pattern is required on both sides of the mid-parts. From this it is obvious that green-sand stack moulding cannot be adopted at short notice and is unsuitable for small numbers off a great variety of patterns.

In machine-tool production, thousands of patterns may be in circulation, coming to the foundry at very short notice for numbers off from 1 to 48. The number of boxes which can be used in a green-sand stack is limited by the pressure which the lowest box will stand, and in the case of machine boxes without bars, this safe limit of height is not much over 24 in., even with careful ramming of the drag and hand tucking after setting it down on the floor.

Indeed the process in green sand seems only suitable for castings of the piston ring type in which the metal will set quickly and terminate the interval of effective pressure of the liquid metal. For castings of over an inch in thickness the metal remains liquid for quite an appreciable time, and under the steady pressure the time factor allows heavy swelling to occur due to the sand flowing under pressure. This, of course, can be remedied to a large extent by drying the moulds, but the one advantage of green sand, that of immediate turn over, is thereby lost, and it seems that this is never done in the industry.

The ratio of strength of green sand, dry sand and oil sand may be taken roughly as 5, 100 and 500 respectively, and the limit of height of stacking will be controlled by these relative strengths. It is, however, not convenient or necessary to make stacks higher over all than say 7 ft. even when starting the stack in a pit and climbing on top of a barrel in order to pour a stack is inclined to make one think of the pre-war slogan "Safety-First." Again, the maximum height of stack may be regulated by the thickness of the casting and the minimum thickness of sand between the castings, because the metal may remain liquid long enough to destroy the organic bond material and cause partial or complete collapse of the sand under liquid pressure.

Oil Sand "Cores" Used

In oil sand, the stack is built of a series of blocks secured by ramming up in any suitable mid-part boxes on frames, and the blocks are made in ordinary wooden "Core Boxes" into which the patterns are fixed. The wooden open topped "core" box is made in the usual style of a depth, for example, 2½ in. to 3 in. for patterns about 1 in. thick to cover the pattern, *i.e.*, between each casting in the completed stack. These patterns are placed in the most suitable arrangement and preferably fixed. The gates are also best fixed by the patternmaker, and once a number of these gates patterns have been made they can usually

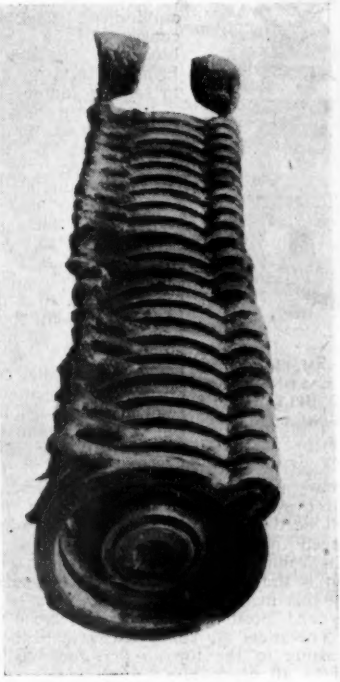

FIG. 20.—A STACK OF "OIL SAND" CASTINGS HEIGHT 5 FT. 4 IN.

Oil-Sand Practice

be worked in to suit all sorts of castings of roughly similar size.

Several examples were illustrated in a previous article showing the castings being run through one another. All these castings are machined over and are required free from surface defects. Fig. 20 shows a remarkable example of a 22-high stack. The castings are 30 in. diameter and 8 in. diameter, one pair in each block 3 in. thick. The castings are 1½ in. thick, having only 1½ in. sand between one casting and the next above and below. The small centre casting is run off the larger one on the joint line.

FIG. 21.—SMALL STACK OF CASTINGS FOR "V" BELT PULLEY SHOWING A COMMON RISER.

The weight of metal in the heads or basins combined is 56 lbs., whereas casting these castings singly with the same method of running 11 cwts. over metal would result, plus an addition for the greater depth from the basin to the casting in individual moulds. A less ambitious stack would consist of a composite block, *i.e.*, a sunk parting being made in the flat block to receive another core.

The main reason for applying stack moulding to this casting is that the pressure appears to produce castings by this method free from porosity under water test, whereas the same casting is liable to be porous when cast singly in dry sand. Simple castings only are illustrated in the examples given, but it is just as easy to make oil sand "cores" or blocks into which smaller cores are placed and secured by a cement of semi-solid core oil. Stack moulding is certainly not confined to block patterns. Fig. 21 shows a heavy pulley for tex-rope drive. Each mould is made of two half blocks, moulded from the same box; it will be observed that gate and sprue have not been changed over before making the second half resulting in a blind gating system.

Attention is drawn as evidence that the making of castings by this method is not as sensitive to critical dimensions and positions of gates as green sand or dry sand. The risers are connected through the centre of each casting to the top so that rod feeding can be applied to all at once.

Cast-iron grids are of course not used in these oil sand cores or cakes, but pieces of round iron used very sparingly give additional safety in handling. These are recovered from the stack, and are available for use for an indefinite period. It does not seem to be necessary to coat these rods with claywash or core oil solution in order to get the sand to adhere. The rods or wire can of course be bent to fit between the patterns as required, and some form of bending machine may be provided to facilitate this work if desired. If this is not provided the moulders will usually be found bending the rods by placing one end through a hole in the bench or part of the moulding machine with indifferent results and some damage to the bench or machine.

The ramming can be as hard as possible without causing mould defect due to low permeability, and hard ramming is best for keeping down any tendency to "searching" or roughness on the casting surface, and this precaution is most necessary when using burnt and/or ground core sand rebonded. While the position and arrangement of gates in foundry practice usually follows certain more or less unwritten laws, established by long experience and justified mainly by previous success, the question of arranging the patterns in the box so as to make the best of the available space must also be considered and the arrangement adopted may mean running the metal through one of the castings to another, and in this respect considerable latitude may be taken, in castings of uniform thickness.

Other types of castings, such as the VEE belt pulley (Fig. 21) which tends, owing to its shape, to solidify with a porous patch or cavity in the bore of the boss, may be stacked with a riser from the boss of one of the castings through each in turn to the top so that one rod may feed the entire stack of castings with very good results.

The same method applies to such castings as shaft couplings. After ramming and stripping the oil sand core or block, a groove may be cut in opposite sides which makes for ease of lifting the core into the correct position on the shaft. The blocks or cores may be swab-painted, but preferably sprayed with blackwash or quite a variety of liquids such as core-oil solution, with blackwash or plumbago in suspension. Silica flour washes have been suggested, but there is a strong tendency with certain types of oil sand for this type of wash to cause small scabs all over the metal surface, and it is difficult to see how it can be any better than the carbonaceous coatings. This is particularly so in the case of oil sand below 400 lbs. dry strength. Here it should be noted that the author is merely expressing his own experience in the matter.

The drying, it may be argued, introduces an operation which is not required in green sand, and of course stove capacity is required. The author found it most convenient to install a small stove in a shed off the foundry proper where the cores or blocks are moulded, dried and only taken into the foundry in complete lots immediately prior to stacking. The drying should of course be pyrometically controlled, and this should not be neglected even though the stove be relatively small and the pyrometer expensive.

(To be continued.)

INSTITUTE OF BRITISH FOUNDRYMEN

(*Concluded from page* 74.)

Wood, Limited, Bradford; C. Perrin, patternmaker, Craven Bros., Limited, Manchester; E. T. Reade, draughtsman, Wallwork Gears, Limited, Manchester; J. Robertson, foundry manager, W. McPhail & Sons, Glasgow; C. J. Shaw, metallurgist, Dobson & Barlow, Limited, Bolton; W. Smalley, Cupola chargehand, English Electric Company, Bradford; A. Spencer, chief inspector, T. Locker & Company, Limited, Bury; R. Spurgeon, iron moulder, Tortoise Foundry Company, Halstead; C. I. Teeling, foundry assistant, Midland Electric Company, Birmingham; J. Terrell, Northern representative, Wallwork Gears, Limited, Manchester; T. W. Thatcher, foundry foreman, Tangyes, Limited, Birmingham; A. Thow, foundry foreman, Carron Company, Limited, Falkirk; H. W. Turner, foreman patternmaker, High Duty Alloys, Slough; J. A. Wellings, assistant to works superintendent, Magnesium Castings & Products, Limited, Slough; H. Astin, metallurgical laboratory assistant, National Gas & Oil Engineers, Manchester; A. C. Bailey, moulder, Harland & Wolff, Limited, Glasgow; E. E. Bester, foreman patternmaker, Warwill, Limited, Abertillery; W. D. Douglas, radiologist, Rolls-Royce, Limited; H. S. Exton, foundry foreman, Goulds Foundries, Newport; D. McK. Lindsay, coremaker, Harland & Wolff, Limited, Glasgow; P. Muir, moulder, Harland & Wolff, Limited, Glasgow; J. R. Naylor, foreman moulder, A. Robinson, Liverpool; T. Oldham, pattern-moulder, Howard & Bullough; E. R. Quinton, foreman moulder, Warwill, Limited, Abertillery; O. R. Smith, metallurgist, Northern Aluminium Company, Cardiff; J. K. Adamson, foundry engineer, Teesside Bridge & Engineering Works, Middlesbrough; W. Bradley, assistant foundry works manager, Cochranes (Middlesbrough); J. A. Cutter, foreman steel moulder, Davy United Roll, Middlesbrough; C. D. Ellis, iron moulder, W. B. White & Sons, Colne; D. H. Floyd, technical assistant and draughtsman, Foundry Equipment, Limited, Leighton Buzzard; F. Hart, metallurgical chemist. N.E. Iron Refining Company, Stockton; A. R. Howells, moulder, J. Williams, Limited, Cardiff; J. W. Lambert, laboratory assistant, Davy & United, Middlesbrough; G. H. Stevens, ironworks chemist, Cochranes (Middlesbrough); H. Worton, metallurgist, Teesside Engineering Works, Middlesbrough; P. H. Drury, metallurgist, J. Harper & Company, Limited, Wallinham; S. W. Palmer, research metallurgist, B.C.I.R.A.

As Associate Members (Transferred)

E. H. Beech, foreman moulder, Metropolitan-Vickers, Manchester; E. W. Popplestone, technical assistant (X-ray), Mullard A.V. Company, Surrey.

As Associates

J. Allan, patternmaker, Harland & Wolff, Glasgow; R. J. Allen, fitter and turner, Austral Iron Works, Johannesburg; H. Doeg, reader, "Rand Daily Mail," S.A.; H. J. Jacobs, apprentice moulder, C.E.W., Pretoria; F. Machin, apprentice draughtsman, Barrow; C. S. Vaughan, chemist, Hill Top Foundry Company, Willenhall.

LABOUR DIFFICULTIES AT AMERICAN FOUNDRIES

Man-power shortage in the American foundry and forging industries continues one of the most critical bottlenecks in war production, reports "Steel." Determined efforts in both industries to solve the problem have brought some relief, but the situation continues critical and the outlook is not too promising for substantial improvement in the near future. For one thing, recruitment of labour is difficult in both fields because of the unattractiveness of many jobs which are open. Further, the War Man-power Commission has been unable to eliminate the high rate of job turnover in both fields.

Agencies and prime contractors are experiencing difficulty in placing new orders with malleable foundries. Lagging production of certain grey iron items is reported. Some non-ferrous foundries are producing exclusively for war work; many of these shops are new, having been built exclusively to take care of the needs of the increased aircraft programme. To offset the labour shortage in these industries the War Man-power Commission has developed a programme in co-operation with War Production Board, Army, Navy, Maritime Commission, and the Office of Price Administration.

Under this programme, the W.P.B. is preparing a list of critical foundry products, and will indicate to W.M.C. those foundries which apparently are at present producing a critical item and are behind schedules due to man-power difficulties. The W.M.C. will complete labour utilisation studies and recommendations for improvement for those foundries that produce a critical product and are apparently in man-power difficulties. Foundries producing solely a critical product and certified as making maximum utilisation of their labour, will be listed by the W.M.C. as "approved foundries." The Selective Service system will devise a procedure whereby workers in approved foundries will be given special consideration for occupational classification whether skilled or unskilled.

Foundries on the approved list will be entitled to: (*a*) Permission to clear workers outside of their area; (*b*) special consideration on deferment under the Selective Service system; (*c*) upon proper showing, will receive assistance from W.M.C. in presentation of their requests for wage and price adjustments to the W.L.B. and O.P.A.; (*d*) the W.M.C. will ask the Navy, Army, Maritime Committee and the W.P.B. to make similar representations to W.L.B. and O.P.A., on requests from approved foundries. The W.P.B. will give increased emphasis to the improvement of labour relations and worker morale in approved foundries. W.P.B. will exert every effort to obtain proper plant facilities for approved foundries, including lockers, rest rooms, cafeterias, etc. When necessary, the government will assist in financing the costs of such improvements.

The W.P.B. will seek out, plant by plant, methods of increasing production through improved industrial processes, and will assist in the necessary action to provide and to install such improvements.

CANADIAN PRACTICE FOR THE CASTING OF NON-FERROUS TEST BARS

Canada has now issued this Tentative Specification for Non-Ferrous Test Pieces

This report, which is issued as a recommendation of the Canadian Non-Ferrous Casting Advisory Committee, has for its main object the assisting of those foundries which have never been called upon to supply castings to physical specifications.

A test bar cast under carefully controlled conditions is recognised by the Committee as being *only a guide to the quality of the metal* in a casting or group of castings and in no way should its physical properties be considered as representing the physical properties actually existing in the casting. The physical properties of the test bar, coupled in most cases with the analysis, do, however, constitute the only practical guide to the inspection authorities as to the quality of the castings. *It therefore follows that it is not the intention of the Committee to over-emphasise the value of a test bar, and foundries should not overlook the fact that the same care taken in making a sound casting should be duplicated in the test bar.*

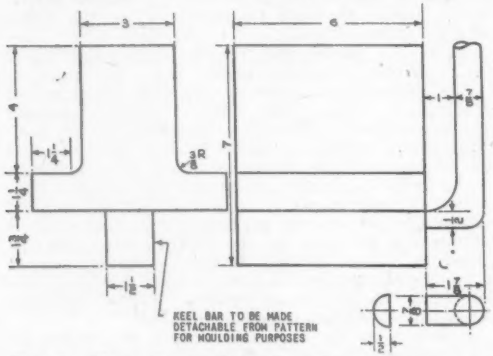

FIG. 1.—KEEL BLOCK TEST BAR RECOMMENDED BY THE HIGH SHRINKAGE ALLOY GROUP.

Cast-on test bars versus separately cast bars.—The Committee *condemns* the practice of attaching test bars to the casting, and recommends that all test bars be cast in a separate, especially prepared, mould. This recommendation is based on the fact that it is, in most cases, difficult to attach a test bar to a casting which will be adequately fed during solidification. It is most likely that the test bar will feed the casting or the casting feed the test bar, and such conditions are to be avoided.

Dry sand versus green sand moulding.—The Committee recommends that all test bars be made in dried sand moulds without the use of facing materials to eliminate the factor of moisture affecting the physical properties of the test bar. The mould should be allowed to cool to room temperature before casting the test bar.

Melting.—The Committee recommends that all non-ferrous alloys be melted under slightly oxidising conditions. This procedure is recognised as yielding the

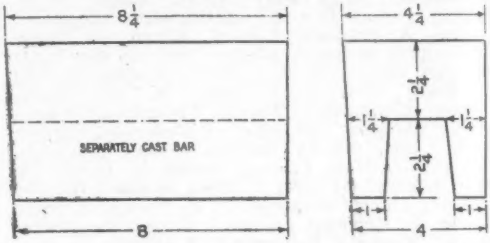

FIG. 2.—A TYPE OF TEST BAR WHICH MAY BE USED AS AN ALTERNATIVE TO THE KEEL BLOCK.

Recommended Types of Test Bars and Their Pouring Temperatures.

	Committee's Recommendation.	Alternative.
	KEEL BLOCK. Test Bar. Deg. C.	U.S. NAVY. Test Bar. Deg. C.
A. *High Shrinkage Alloys*		
Silicon bronze—		
(*a*) High zinc content (10 per cent. zinc and over) ..	1,010	1,010
(*b*) Low zinc content ..	1,037	1,037
Manganese bronze—		
(*a*) High tensile (40 tons per sq. in. tensile and over)	1,065	1,065
(*b*) Low tensile (less than 40 tons per sq. in. tensile)	1,010	1,010
Aluminium bronze	1,120	1,120
Naval brass	1,010	1,010
	CROWN Test bar.	WEBBERT Test bar.
B. *Tin Bronzes, Red Brass and Semi-red Brasses*—		
(*a*) Phosphor-bronze ..	*	*
(*b*) Tin bronze, red brasses and semi-red brasses ..	1,150	1,150

* Pouring temperature of phosphor-bronze will depend upon the quantity of phosphorus present and will range from 980 to 1,150 deg. C.

best results in practice. Those alloys such as the tin bronzes, and red brass which require deoxidation should be deoxidised thoroughly with phosphor copper immediately before pouring the test bar mould.

Pouring.—The Committee recommends that the test bar be poured from the same heat of metal as the casting it represents, and, if practical, from the middle of the pour. The latter condition must, however, coincide with the optimum pouring temperature for the type of metal and test bar.

Pyrometric Control.—The Committee recognises that test bars cast under conditions of varying temperature will lead to varying results, and therefore recommends that all test bars be cast under pyrometric control. *The correct pouring temperature is a constant factor for any given metal cast in a given type of test bar.* For example, "B" metal cast in a dry sand Crown type test bar mould has one pouring temperature that will yield the maximum physical properties.

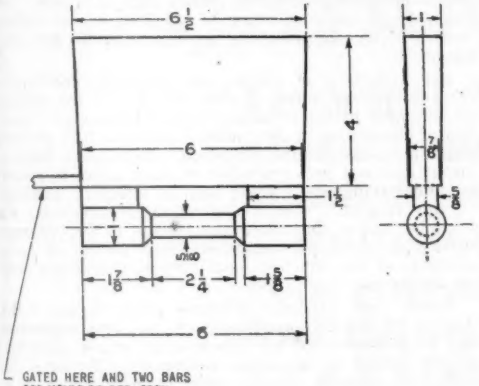

FIG. 3.—RECOMMENDED FOR THE TIN BRONZES, RED BRASSES AND SEMI-RED BRASSES.

Cooling.—The Committee recommends that the test bars be allowed to cool in the mould for at least three hours after pouring, and under no circumstances should they be quenched in water or other cooling medium. The exceptions to this rule are test bars of heat-treatable aluminium bronze with a combined iron, manganese and nickel content of less than 3 per cent. aluminium bronze with a combined iron, manganese and nickel content over 3 per cent does not need to be quenched to develop its full physical properties.

Radius of the machined test bar.—As illustrated in Fig. 5, the Committee recommends that the minimum radius of the shoulder of the test bar be not less than $\frac{3}{8}$ in.

Conclusion.—While it is recognised by the Committee that there are other types of test bars which

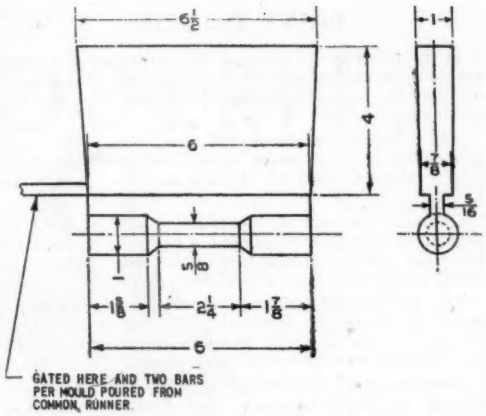

FIG. 4.—MAY BE USED AS AN ALTERNATIVE TO THE CROWN TYPE BAR FOR THE DUTIES SPECIFIED.

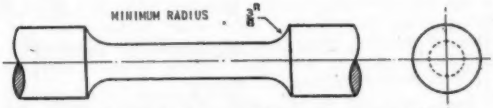

FIG. 5.—ILLUSTRATES THE RADIUS OF THE TENSILE TEST BAR SPECIMEN AS RECOMMENDED BY THE COMMITTEE.

will yield satisfactory results, the recommendations of the Committee, as made, are considered the best for the alloys under consideration. It is sincerely hoped that the foundry industry will benefit from the experience of the members of the Canadian Non-Ferrous Castings Advisory Committee.

WOOD DUST IN MOULDING SAND

The Institute of British Foundrymen has just published a short Report through its Sands Sub-Committee of the Technical Committee, which demonstrates that wood dust can be used wholly or partly to replace coal dust for most light- or medium-weight iron castings. Roughly, a quarter of the weight of coal dust is necessary as a replacement. Its influence on the sand is to reduce the green compression strength by about 15 per cent. and to increase the plasticity. The permeability tends to increase with continued use. Foundrymen interested in this subject, especially those who desire or can give additional information from actual tests, should write to Mr. John Bolton, acting secretary, the Institute of British Foundrymen, St. John's Street Chambers Deansgate, Manchester, 3.

NEWS IN BRIEF

IT IS PLANNED to form a federation of the trade associations interested in the manufacture of engineers' small tools. Lord Riversdale is expected to be the first president.

THE ENGINEERING WORKERS' claim for a 10s. wage advance is to be discussed between the unions and the Engineering Employers' Federation in London on February 3.

RICHARD THOMAS & COMPANY, LIMITED, have redeemed and cancelled £145,831 4 per cent. redeemable prior lien mortgage debenture stock, thus reducing the outstanding amount to £3,065,931.

THE BRITISH shipbuilding industry is forming immediately a Research Association for the development of all branches of research associated with shipbuilding, marine engineering and ship-repairing.

CONTRIBUTIONS amounting to £517 were made by employees of the Grahamston Iron Company, Limited, during 1943 to various objects, including the Falkirk and District Royal Infirmary, the Red Cross, motor ambulance convoy, etc.

SIR ANDREW DUNCAN, the Minister of Supply, arrived in America last week. He is to confer with Mr. Donald Nelson, chairman of the United States War Production Board, and Mr. Eugene Grace, president of the Bethlehem Steel Company.

JOHN GARDOM & COMPANY, consulting engineers, Ripley, Derbyshire, have sent us a wall calendar carrying at its right side the iron-carbon equilibrium diagram, a brand new cupola operational graph, curves for relating Vickers, Shore and Brinell hardness numbers, and service pipe-line colours.

THE NON-FERROUS METALS CONTROL has released supplies of zinc sheets for the repair and renewal of eave gutters, valley gutters, ridgings, rainwater pipes, and flashings, and for the construction of new flashings. No zinc will, however, be available for new work on roofs, and the thickness of all zinc sheet used is restricted to No. 10 gauge.

TWO NEW CHAPTERS (BRANCHES) have been added to the long list of those attached to the American Foundrymen's Association. One is to cater for the foundries of Texas, and the second for those of Rochester, New York. The latter, the twenty-sixth chapter to function, are now the holders of the cast-iron rattle which is retained until another branch is formed.

THE UNITED STATES War Production Board has ordered a halt in the construction of four steel plants because sufficient steel producing capacity is now available to carry on the war. Other contracts, it is reported, are being reviewed for possible cancellation. Steel ingot output during this year is expected to be lower than in 1943; in fact, both production and distribution of steel are expected to be nearer normal during the next few months than at any time since the United States entered the war.

MR. FRED MARSHALL, M.P., chairman of the National Union of General and Municipal Workers, writing in the union's "Journal" for January, puts the blame for unofficial strikes partly on works committees. "It is inevitable in the nature of things," he says, "that sooner or later they begin to exceed the purposes for which they were set up. They tend to become an organisation within trade unionism, possessing power without responsibility. They also give great scope to disruptive elements whose object is certainly not the welfare of trade unionism."

THE SOUTH AFRICAN GOVERNMENT are contemplating development of the mineral wealth of Namaqualand, Natal, according to Col. C. F. Stallard, Minister of Mines. The possibilities are said to be considerable, copper and tungsten already being mined, and in increasing quantities. The Government are prepared to assist financially and with technical advice all producers of tungsten and other strategic minerals where prospects appear to justify such a course. Investigations are proceeding in the Potguterust district in the hope of discovering molybdenum in workable quantities.

THE ADEQUACY of labour, raw materials and equipment to restart industry after the war is the subject of comment by the directors of the Manchester Chamber of Commerce in their annual report. It is pointed out that materials and equipment will require finance, and it may not prove possible in many cases to restart an undertaking without the help of adequate facilities in this respect. On the question of controls, the Chamber states that there now seems to be common agreement about the retention for a period of some elements of the directive machinery to deal fairly with all concerned.

AMONG THE RECOMMENDATIONS made in the F.B.I. Report on Industry and Research was one suggesting the establishment of an organisation whose principal objects would be to stress continuously the need for industrial research and to promote and foster it in all possible ways. The form and functions of this suggested organisation were discussed at a recent conference summoned by the F.B.I. and attended by representatives of the Royal Society, the Department of Scientific and Industrial Research, the Universities, and the Research Associations. A full discussion took place and a sub-committee was appointed to inquire further into the subject and to report back.

RETURNS show that in the first half of 1943 net profits of leading steel producers in the United States representing over 90 per cent. of the industry's ingot capacity, were 8 per cent. below a year before and 40 per cent. less than recorded in the same period of 1937. Net income for these companies totalled $94,522,000 in the first six months, compared with $102,743,000 for substantially the same companies in the corresponding period of 1942. The return on investment for the first half was at the rate of 4.9 per cent. per year against 5.3 per cent. a year earlier. Lower earnings primarily reflected the sharp increase in total payrolls to $1,236,485,000 from the $969,855,000 in the first half of 1942.

THE MODERN PIG

IF YOU WANT...
clean iron, free from sand, free from sows ...uniform analysis... convenient size...easy handling... specify
STANTON
MACHINE CAST PIG IRON

SPECIFICATION

WEIGHT	80-90 lbs.
Length	22 inches
Width	8½ inches
Thickness	3¾ inches

(at notch 2½ inches).

Ample supplies direct from stock

THE STANTON IRONWORKS COMPANY LIMITED NEAR NOTTINGHAM

COMPANY RESULTS

(Figures for previous year in brackets)

T. M. Birkett & Sons—Interim dividend of 5% (same).

British Piston Ring Company—Interim dividend of 5% (same).

Coley Metals—Dividend of 20% on the ordinary shares (same).

J. Samuel White—Final dividend on the ordinary shares of 4%, free of tax (same), making 6½% net (same).

Allied Ironfounders (Ireland)—Profit to June 30, 1943, £7,834; to general reserve, £2,000; debit forward, £9,635 (£15,469).

Fairfield Shipbuilding & Engineering—Dividend on the 6% cumulative preference shares for the half-year ended December 31, 1943.

Edwin Showell & Sons—Net profit to June 30, £8,015; preference dividend, £472; ordinary dividend of 10% (same) and a 5% bonus (same), £1,389; to reserve, £6,000; forward, £3,977 (£3,823).

Power-Gas Corporation—Profit for the year ended September 30, 1943, £89,248; to reserve, £11,000; taxation, £59,000; brought in, £29,131; dividend of 10% and a dividend bonus of 2½%, less tax, £18,750; forward, £29,629.

Wellworthy Piston Rings—Profit for the year ended July 31, after depreciation and taxation, £33,787 (£32,778); ordinary dividend of 15% (same); to reserve for deferred repairs, £10,000 (nil); to general reserve, £10,000 (same); forward, £16,125 (£19,738).

John Williams & Sons (Cardiff)—Trading profit to September 30, after providing for taxation and reserves for post-war repairs, new plant, etc., £15,260; preference dividend, £1,500; final dividend on the ordinary shares of 7½% (same), making 12½%, free of tax (same); to general reserve, £4,000; forward, £8,878 (£8,618).

Carrier Engineering Company—Trading profit for the year to June 30 last, £94,862 (£98,933); investment income, etc., £4,299 (£4,481); depreciation, £9,232 (£12,948); taxation, £29,194 (£22,569); net profit, £60,503 (£67,600); dividend of 25% (same) on the ordinary shares; to reserve, £10,000 (nil); forward, after preference dividends, £107,401 (£103,552).

SIR WILLIAM J. LARKE MEDAL

Sir William J. Larke, K.B.E., has endowed a fund to enable the Council of the Institute of Welding to offer for competition each year a bronze medal for the best Paper on the practical aspects of welding submitted in accordance with the regulations in force. The Council have resolved that this medal shall be known as the Sir William J. Larke Medal of the Institute of Welding, and that the first competition shall be held in 1944. The Council have also decided, in the competition of 1944, to award a first prize of £50 to the winner of the medal, a second prize of £30 and other prizes, to be allocated at the discretion of the examiners, of a total value of £20.

NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Windmill Engineering Company, Sunfield Works, Windmill Lane, Denton, Lancs—£10,000.

Oil Engines (Coventry)—£10,000. R. C. Howley, 17, Throgmorton Avenue, London, E.C.2, subscriber.

Tyler & White Engineering Company, 39, Bond Street, Nuneaton—£1,000. L. S. Tyler and C. J. White.

Wassell & Clayton, 76, Trafalgar Street, Sheffield—General engineers. £1,000. R. Wassell, A. F. Clayton, and S. W. Bell.

Penman Metallic Packing & Engineering Company, 29, Orchard Street, Newcastle-upon-Tyne—£1,000. A. E. and M. E. Willis.

R. Doughty & Son, Birch House, Birch Street, Wolverhampton—Stampers, piercers, etc. £2,000. C. D. Doughty and H. F. Roper.

Townsend & Williams—Engineers and tool makers. £3,000. V. W. Williams, Holly House, Balsall Street East, Balsall Common, Coventry.

Plastilite Patents—Engineers, manufacturers of plastic materials, etc. £2,000. R. P. Hinds, 19, Sefton Road, Petts Wood, Kent, subscriber.

Pitt & Swatkins, 12, St. Paul's Square, Birmingham, 3—Toolmakers, engineers, metal spinners and workers, etc. £5,000. W. A. and S. F. Swatkins.

British Industrial Engineering Company (Wolverhampton), 31, Queen Street, Wolverhampton—£2,000. S. Gittins, G. F. Jones, and J. B. Rodger.

Rowlett Engineering Company, 2, Church Row, Wandsworth, London, S.W.18—£5,000. G. S. W. Mills, H. E. Rutland, R. E. Packham, and H. F. Wood.

J. & J. Downey, 30, Budge Row, London, E.C.4—Ship repairers, electric welding and general engineers, etc. £5,000. J. T. and J. R. Downey and J. W. Armstrong.

OBITUARY

MR. H. SALMON, works manager and a director of the Expanded Metal Company, Limited, has died at the age of 67.

MR. JOHN NEILL HALL, a director of Laird & Son, Limited, Irvine, drop forgers and stampers, died on January 16.

MR. FRANK LEWIS CADDICK, for the past twenty years secretary to Walker Bros., Limited, Pleck Road Ironworks, Walsall, has died at the age of 54.

MR. G. M. HARROWAY, for 30 years general manager of Sir Raylton Dixon & Company, Limited, shipbuilders, of Middlesbrough, died on January 15 at his home at Darlington.

NEWS HAS BEEN RECEIVED that Sgt. Albert Hobbs, R.A., of Canterbury, has been lost at sea after being taken prisoner during the fighting in Libya. Before the war he was employed at the Canterbury foundry of H. M. Biggleston & Sons, and he served in the Middle East under the late Lieut. Desmond Biggleston.

WM CUMMING & CO., LTD.

FOUNDRY PLANT

The "CUMMING" PATENTED CRUCIBLE FURNACE

"SKLENAR" FURNACES

OIL-SAND MIXERS

ELECTRIC RIDDLES

MOULDING MACHINES

FOUNDRY SUPPLIES

CORE OILS

SEMI-SOLID K92 AEK

CREAMS CCC CIC

PARTING POWDERS XP AND OTHER NON-SILICA GRADES

"STANDARD" "NEW GRADE" EX STOCK.

KELVINVALE MILLS, MARYHILL, GLASGOW. N.W. AND BRANCHES.
AT FALKIRK, CHESTERFIELD, DEEPFIELDS, AND MIDDLESBROUGH.

NEW PATENTS

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.

557,655 PROTECTIVE METAL FINISHES, LIMITED, and BERGSTEIN, G. K. Electro-deposition of nickel.

557,669 STERN, M. Method of treating light metal scrap.

557,677 CHROMIUM MINING & SMELTING CORPORATION, LIMITED. Production of ferro-alloys substantially free from gangue materials.

557,715 WOOD, D. H. Foundry ladles.

557,719 LANE & SONS, LIMITED, G., and LANE, F. Woven wire belts or conveyors.

557,749 PHILIPS LAMPS, LIMITED (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). Method of imparting improved magnetic properties to alloys capable of being hardened by precipitation.

557,788 CUMMING & COMPANY, LIMITED, W., and CAYZER, J. R. Ventilators for crucible and like furnaces.

557,814 BUDD MANUFACTURING COMPANY, E. G. Apparatus for testing the compression strength of large structures such as rail cars.

557,845 MARINE MAGNESIUM PRODUCTS CORPORATION. Process for manufacture of magnesium products.

557,846 PYRENE COMPANY, LIMITED (Parker Rust-Proof Company). Coating of metal sheets.

557,868 STEVENS, A. H. (Minerals & Metals Corporation). Apparatus for the production and consolidation of metals and alloys.

557,881 UDY, M. J. Production of iron or steel alloys.

557,910 MAGNESIUM ELEKTRON, LIMITED, and BUSHROD, C. J. Processes for the protection of magnesium and magnesium base alloys against corrosion.

557,912 FIFE, J. G. (Shell Development Company). Process of protecting metal surfaces.

557,916 REYROLLE & COMPANY, LIMITED, A., LEYBURN, H., and ALDERSON, R. Control and protection of electric arc-furnaces.

557,951 SHAW, J. Machines for perforating metal strips.

557,928 HEPPENSTALL COMPANY. Dies and die steels.

557,938 ELECTRIC RESISTANCE FURNACE COMPANY, LIMITED, SQUIRE, L. E., and COTTRIDGE, D. E. J. Quenching tanks for furnaces for the heat-treatment of metal objects and the like.

557,968 MANDL, A., and METROPOLITAN-VICKERS ELECTRICAL COMPANY, LIMITED. Dynamo-electric machines.

557,998 MORRIS MOTORS, LIMITED, DONO, G. E., and GODDARD, R. H. Bending of tubes.

558,007 ALNCIN, INC. Abrasive tools and method of making same.

558,023 MILLS, LIMITED, W., and PAIGE, J. F. Aluminium alloys.

558,033 PIRELLI-GENERAL CABLE WORKS, LIMITED, and BEAN, R. Electric cable insulation.

558,037 CROWE, E. F. S. Means for cutting screw threads.

PERSONAL

MR. A. CORNTHWAITE, manager of Thos. Altham & Son, ironfounders, has been elected president of the Penrith Chamber of Trade.

MR. J. N. BUCHANAN, deputy-chairman of Minerals Separation, Limited, has been appointed chairman in place of the late Mr. Francis L. Gibbs.

MR. W. L. REES has been appointed plate mill manager by the Consett Iron Company, Limited, in succession to Mr. Morris Williams, retired.

MR. ALBERT CORKER has received a presentation from the directors of the Midland Iron Company, Limited, Rotherham, to commemorate his diamond jubilee with the company. Mr. Corker is still a director of the company, but resigned the position of general manager 12 months ago. This year the Midland Iron Company, Limited, will celebrate its centenary.

DR. C. SYKES, superintendent of the metallurgy department of the National Physical Laboratory, has been appointed principal of the Brown-Firth research laboratories in succession to the late Dr. Hatfield. At present he is also superintendent of the Terminal Ballistics Branch of the Armament Research Department, and arrangements have been made whereby he will continue in that capacity after taking up his new duties on March 1.

SIR CLIVE BAILLIEU, deputy-president of the Federation of British Industries, has accepted the chairmanship of the F.B.I. Empire Committee. Sir Peter Bennett, M.P., a past president of the Federation, will assist him as deputy chairman of the Committee. Capt. B. H. Peter (managing director of the Westinghouse Brake & Signal Company, Limited), the former chairman of the Committee, has been compelled to resign owing to his many other commitments. He will, however, remain a member of the Committee and of its Executive.

Will

DUGMORE, T. W., of Willenhall, formerly a director of Beddow & Sturmey, Limited (now Heenan, Beddow & Sturmey, Limited) £12,237

POST-WAR DISPOSAL OF SCRAP METAL

The Joint Scrap (Non-Ferrous) Committee have submitted to the Government their suggestions as a basis for discussion of the post-war disposal of Government-owned non-ferrous scrap metals, and at the same time are pressing the Minister of Supply to implement the promise given by the Raw Materials Department of the Ministry and the Non-Ferrous Metals Control to consult the trade before arriving at any decision on post-war disposals. The Joint Committee represents the national associations of the trade, comprising in all over 1,000 firms dealing in non-ferrous scrap metals.

Patch

WORN FURNACE BRICKWORK WITH

Durax No. 1

PLASTIC FIREBRICK COMPOSITION

WHEN quick repairs to worn furnace brickwork are required, Durax No. 1 provides an excellent patching medium. It is supplied in a stiff, plastic condition ready for use. It possesses exceptionally high refractoriness, negligible shrinkage on drying, and good resistance to thermal shock.

Durax No. 1 is also frequently used as a rammed monolithic lining in small size furnaces, such as crucible furnaces, owing to the ease of installation — the avoidance of special shapes—and because it provides a strong, durable structure. Users who require further information concerning the uses of Durax No. 1 should communicate with the G.R. Technical Department.

General Refractories LIMITED

GENEFAX HOUSE, SHEFFIELD, 10

37 TELEPHONE: 31113 (6 LINES)

FIREBRICKS · BASIC BRICKS · ACID-PROOF MATERIALS · CEMENTS

PLASTICS · INSULATION · SILICA BRICKS · SILLIMANITE · SANDS

Raw Material Markets

IRON AND STEEL

Consumers of all grades of pig-iron except hematite can rely upon prompt execution of their orders. The depression in the light foundry trade shows no sign of lifting, and there is an ample supply of high-phosphorus iron. Moreover, the recent expansion in the output of low- and medium-phosphorus grades has synchronised with a slight decline in the activities of the special and engineering foundries. Consequently, low-phosphorus irons and also refined iron are now quite freely available.

Scrap is not too plentiful, but requirements are being met fairly well on the whole, and in any case plenty of pig-iron is available. There are ample supplies of coke.

The shipyards are providing strong support for the finished iron trade, which is now more busily employed than at any period during the past twelve months. All classes of bar iron are in particularly strong request, demand having been stimulated by the extended delivery dates indicated by makers of steel bars.

The re-rolling industry has entered upon 1944 with highly favourable prospects. The re-rollers have an abundance of work on hand. Good stocks of semis are held, and steelmakers maintain their deliveries of primes and defectives at a satisfactory level. The demand for light structural material and special sections is especially brisk, while the sheet-makers have heavy bookings not only from the shipyards, but also for the lighter gauges, which are required in increasing quantities for huts, containers, mines, bombs and depth charges. Galvanising of sheets is only permitted for special purposes, but an early improvement in the supply of spelter is now anticipated.

There has been no slackening in the call for plates. Although shipbuilders are making the heaviest claims on the plate mills, their specifications are augmented by a wide variety of other industries of national importance and orders already booked will absorb practically the whole of the output until the end of June. Scarcely less urgent is the demand for light and medium sections, and wire-drawers and rivet makers are also exceptionally busy.

NON-FERROUS METALS

Few of the metals needed to wage a modern war were in surplus supply when Britain began hostilities against Germany in September, 1939, and probably at times during the period which has since elapsed shortage of shipping space and losses due to sinkings by U-boats have caused the authorities some anxious moments. Rigid control of all metals, ferrous and non-ferrous, in order that supplies should go only to essential users, was obviously necessary in the interests of the war effort. Licensing continues to be a pre-requisite of the delivery of supplies, but it is evident that whatever the position may have been in the earlier war years, available tonnages of the non-ferrous metals—with the possible exception of tin—have caught up with the needs of users. Tin is in a special category because of the loss of the Far Eastern mines to the Japanese, but even in this metal substantial reserves are held, and although the utmost economy is necessary and substitutes have to be utilised wherever possible, tin is still forthcoming for really essential purposes.

Copper, lead and zinc are all now in good supply and the possibility of releases to meet ordinary civilian needs would appear to get steadily nearer. Even aluminium, production of which it was necessary to expand greatly at the beginning of the war, is now in such good supply that in the United States four plants have been closed down and others may follow, though as far as Britain is concerned there would seem to be a ready opening on essential work for all the aluminium that the authorities can provide. If, with demand at its present level, it is necessary to cut down production of such an important war metal as aluminium, either something fairly drastic will be necessary after the war or extensive new markets for the metal will have to be found. At the same time, sight must not be lost of the fact that in America, as in this country, distribution of aluminium is confined to the war factories. Doubtless there are many openings for the metal in the production of civilian goods which only official policy keeps closed.

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